PUBLIC SAFETY
PSWN PROGRAM
WIRELESS NETWORK

Achieving Interoperability Through Cooperation and Coordination

St. Louis
Post-Symposium Report

FINAL

July 2000

FOREWORD

The St. Louis, Missouri, Public Safety Wireless Network (PSWN) Program Symposium began May 23, 2000, and concluded May 25, 2000. Booz·Allen fulfilled all of the general symposium and facility requirements and ensured that all attendees were registered on-site, sign-in was monitored, and preconference materials were distributed. Booz·Allen also assisted with overall presentation support, including managing each speaker's time. All PSWN Program equipment and the remaining symposium materials were transported back to the PSWN Program Technical Resource Center (TRC) after the symposium. This document describes the key themes discussed during the symposium and includes the final attendance list. The final report will also be sent to those who attended the symposium.

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1. INTRODUCTION

The PSWN Program sponsored the St. Louis, Missouri PSWN Program Symposium from May 23, 2000 through May 25, 2000. The symposium was co-hosted by the Missouri State Police. In the past, the PSWN Program has sponsored similar symposiums in Charlotte, North Carolina; Harrisburg, Pennsylvania; Sacramento, California; Boston, Massachusetts; Chicago, Illinois; Mesa, Arizona; Denver, Colorado; Lansing, Michigan; and Orlando, Florida. The program has also sponsored a mini-symposium in Washington, DC. The purpose of these events has been to discuss issues related to the interoperability of public safety land mobile radio (LMR) communications and public safety shared systems.

The St. Louis Symposium brought together more than 180 public safety officials from around the country to discuss various topics relating to public safety wireless communications interoperability. Introductory and keynote remarks were provided by Major William K. Seibert, Jr., of the Missouri State Highway Patrol and The Honorable Clarence Harmon, Mayor of St. Louis, respectively. During their comments, each acknowledged that certain public safety agencies in the region are developing interoperable systems, while some other agencies continue to plan for new systems. The speakers encouraged attendees to share their experiences and successes in hopes of continuing to improve interoperability in the region and around the country. The speakers also praised the cohesive efforts of the law enforcement community, especially in light of the efforts requiring extensive coordination during the papal visit to St. Louis in 1999.

Following the keynote remarks, attendees were briefed on the PSWN Program and its overall goals and objectives, discussed the key technical and policy issues that are critical to improving wireless interoperability, and were able to ask LMR equipment manufacturers questions about future technology. Attendees were also able to learn about region-specific issues (e.g., the New Madrid Fault and the 1999 papal visit) that required, or could require, significant wireless communications interoperability.

1.1 Purpose

The purpose of the report is to provide a detailed summary of the events of the St. Louis PSWN Program Symposium. It is designed to be an historical resource to those who attended the symposium and to provide a broad overview for those who were unable to attend. In general, this symposium report highlights—

- The key themes that the presentations/panels supported during various portions of the symposium
- The interoperability challenges and success stories that were discussed throughout the symposium
- Key facts and information that were provided to the audience

- The answers to questions of interest that were asked throughout the symposium.

The document is presented according to the major topic areas presented at the symposium. Within each section, the key themes that emerged from a specific topic are presented and thoroughly explained using information presented during briefings and answers to questions asked during panel sessions.

2. SYMPOSIUM TOPICS

The St. Louis Symposium was organized into six key topic areas. The session on each topic area generally lasted for a half day of the symposium. The key topic areas included presentations from various people, ranging from members of the public safety community to PSWN Program managers. Certain topic areas also included panels of experienced public safety officials who answered questions from the audience. The topics were selected to give the symposium attendees a flavor of the PSWN Program and the state of interoperability at all levels of government. The topics covered are listed below:

- PSWN Program is the Leader for Interoperability
- Fostering Interoperability Within States and Regions
- Local Interoperability Updates and Future Plans
- Federal Initiative Updates
- Coordination, Partnerships, and Funding
- Vendor Panel Discussion.

During the sessions, several key themes emerged. In the following sections, each topic and the related themes are presented. The themes are supported by the remarks of the presenters and panelists.

2.1 PSWN Program is the Leader for Interoperability

Over the past 4 years, the PSWN Program has worked with the public safety community at the local, state, and national levels to improve public safety interoperability. During the symposium, the PSWN Program managers described their vision for the program and several of the activities the program is performing. Four key themes emerged during the discussions in this topic area. These themes were evident in the PSWN Program updates and the Salt Lake City tornado presentation that were delivered during the first half day of the symposium. These themes are described in detail below.

Improving radio interoperability can save lives.

The PSWN Program's vision is that of seamless, coordinated, and integrated public safety communications for the safe, effective, and efficient protection of life and property. Specifically, the program is focused on improving wireless interoperability between public safety entities at all levels of government. The PSWN Program is a federally funded (not federal) program,

jointly sponsored by the Department of Justice (DOJ) and the Department of the Treasury (Treasury). The program works together, in partnership, with local and state public safety agencies to improve interoperability.

In its leadership position, the program is developing Public Safety WINS: Wireless Interoperability National Strategy. Public Safety WINS presents the program's strategy for improving interoperability throughout the Nation. Public Safety WINS will serve as an information baseline for the program as the program begins to offer interoperability services to local, state, and federal public safety entities.

Real-life, technical solutions for wireless communications interoperability are available today.

The PSWN Program is working with local, state, and federal entities to conduct interoperability pilots throughout the Nation. These pilot projects allow the PSWN Program to demonstrate interoperability solutions on active systems. The program hopes that these pilots will help initiate future development of interoperable systems. Pilot projects are currently under way in San Diego, California; along the Southwest Border; Salt Lake City, Utah; in South Florida; and Washington, DC. In addition, the program is in the process of assisting Montana in developing a consolidated radio site that will be shared by several entities (local, state, and federal) within the state.

During the symposium, the 1999 Salt Lake City tornado was discussed. The storm highlighted the need for coordinated public safety response and communications interoperability and showed what problems could occur if the new statewide system is not developed. The PSWN Program is supporting the development of a communications system in Salt Lake City. Specifically, it is investigating ways to interconnect DOJ and Treasury communications systems into the state and local systems. During the presentation, a video presentation was shown that highlighted storm damage and communication interoperability problems.

Improving interoperability requires comprehensive coverage of key issues.

The PSWN Program is active in five key issue areas that must be addressed to improve interoperability. The PSWN Program is active in each of these five areas. The issue areas, and how the PSWN Program is addressing them, are provided below.

- **Coordination and partnerships.** Improved coordination and partnerships within the public safety community is critical to improving interoperability in an effort to facilitate new partnerships. The PSWN Program has provided briefings for speakers at annual conferences of national public safety associations. The program hosts regional symposiums to bring together public safety officials to share their ideas and experiences with others.

- **Funding.** Limited funding for communications is a major issue faced by the public safety community. The program has developed reports and guides that highlight the issues related to upgrading and replacing public safety wireless systems and discuss sound funding strategies for the lifecycle of a communications system.

- **Spectrum.** The PSWN Program recognizes that spectrum is a limited resource. The program is supporting efforts to try to acquire more spectrum for pubic safety and to make rules that flexibly allow interoperability.

- **Standards and technology.** The development of standards and open-systems architectures is a key issue that must be addressed to make progress toward improved interoperability. The program is also partnering with the National Telecommunications and Information Administration (NTIA) to fund the development and testing of additional components for voice standards for digital LMR systems.

- **Security.** To ensure that their communications systems are secure, the public safety community needs to incorporate security features into their communications systems. The PSWN Program is developing recommended security guidelines for digital LMR systems and is developing security policy and security planning templates to assist radio managers in designing their system security policies and procedures.

The PSWN Program is seeking to provide direct interoperability support to the states.

The program recognizes that the states are the linchpins for implementing interoperability throughout the Nation. Therefore, the program is seeking to provide direct support to individual states by initiating a dedicated state interoperability campaign. The objective of the campaign is to encourage the trend toward statewide systems development and to provide leadership and expertise on interoperability issues. As a part of the state campaign, the program will work to establish or participate in forums that are tasked with improving public safety wireless communications with their respective states.

2.2 Fostering Interoperability Within States and Regions

The main purpose of this topic area was to highlight ongoing activities in various states and regions designed to combat interoperability problems. Several state representatives shared their experiences with the audience. Speakers included officials involved in regionwide emergencies and officials involved in developing statewide shared systems. Five key themes emerged in this topic area. These themes were evident in the depiction of real life incidents that highlighted interoperable communications issues and interoperability experiences between Missouri and Illinois. These themes are described in detail below.

Various incidents highlight interoperability challenges within states and regions.

Every day, many types of incidents occur that reveal the need for a coordinated public safety response. Interoperable communications is vital to the swift resolution of these incidents. Several of these incidents, or potential major incidents, were discussed at the St. Louis Symposium. Each of these incidents highlighted the vital role of interoperable communications.

Earthquake potential in St. Louis region. One major potential incident is a possible earthquake along the New Madrid Fault which includes parts of Arkansas, Illinois, Missouri, Tennessee, and Kentucky. The New Madrid Fault runs directly through the St. Louis metropolitan area. Severe damage could result if an earthquake were to ever occur along the fault. Interoperability planning for such an incident requires extensive planning. Illinois and Missouri have devoted a significant amount of emergency planning resources to this topic and have attempted to coordinate interoperability systems for a potential major earthquake occurring along this fault. In planning for such an incident, the states must consider—

- Developing plans to back up centralized dispatch systems
- Sharing frequencies between different agencies
- Using satellite communications, including transportable satellite units, for backup
- Understanding amateur radio communications
- Ensuring connectivity between statewide systems and federal agencies (e.g., the Federal Emergency Management Agency [FEMA]) and other necessary agencies, including the American Red Cross.

Salt Lake City tornado. As stated earlier, the Salt Lake City area was forced to focus on the need for coordinated public safety response and increased interoperability following a tornado that hit the area in August 1999. Following the tornado, the public safety response brought many communications interoperability issues to the forefront. These issues included—

- Cell phones and landlines being overwhelmed by incoming calls
- A shortage of talk groups on the statewide system
- Dispatch centers in the city, county, and valley which could not communicate
- Duplicate radio identification numbers
- Medical personnel in the field who could not communicate with one another
- Formal agreements and procedures for interoperability limited law enforcement agencies.

Public safety agencies in the St. Louis area have found ways to achieve communications interoperability in these and similar situations.

Despite the challenges identified by the speakers, public safety agencies in the St. Louis region have several methods by which they currently interoperate. Speakers shared these

methods in hopes of encouraging others to use some basic techniques to achieve interoperability. These methods include—

- Sharing frequencies with adjoining states
- Using scanners
- Sharing spectrum among the groups that interoperate
- Planning statewide communications systems.

Public safety agencies must consider several key issues when planning statewide and regional systems.

Planning statewide and regional systems is a difficult task. Planning these systems can involve technical issues, political considerations, and coordination with peers in other organizations. Many areas around the country have gone through this process and, as a result, best practices have emerged. During the symposium, representatives from Missouri, Illinois, Hawaii, Virginia, and Colorado shared their experiences and some of these best practices. These best practices and additional considerations for developing statewide systems are listed below.

- **Senior-level support.** Senior government support is critical for successful statewide systems. These individuals provide needed support, such as in the legislative process and in supporting requests for funding public safety wireless communications systems.

- **Memorandum of understanding (MOU).** An MOU is a detailed agreement that describes the purpose and intent of the shared system, defines the users, and defines the owner/operator responsibilities. MOUs are sometimes used to forge partnerships and are instrumental in the early stages of planning and partnering.

- **Buy-in from local entities.** Most successful statewide systems have found ways to involve local agencies in gaining support for system development. Well-developed and consistent presentations to important existing and potential stakeholders, including the use of professional quality videos help obtain and maintain buy-in from the government executives, legislatures, the citizenry, and other key stakeholders.

- **Backwards compatibility.** As local, state, and federal agencies move to newer technologies, it is critical to maintain backwards compatibility to continue mission operations and achieve interoperability with legacy equipment.

- **User committees.** Successful statewide systems have user committees to plan their systems and implementation. Specifically, user committees have garnered support and leadership at the local level and enabled local understanding of the goal of the systems.

- **A shared vision.** A compelling vision, coupled with an understanding of the urgent need to improve public safety communications is required to achieve the needed level of support. Furthermore, the state must be willing and able to assume integration

responsibilities for the system and work to overcome turf and coordination issues with local and federal partners.

- **Shared resources.** Successful statewide systems have come together in a formalized way to pool their resources to build, operate, and maintain a shared radio communications infrastructure that is "owned" jointly by the system partners.

Local participation in state and regional systems is important in successful shared systems.

Participation by local entities in state and regional systems is critical to improving interoperability around the Nation. For the local entities, this participation provides an opportunity to access a larger infrastructure and allows agencies to purchase the latest technology at much lower costs. The state and regional systems benefit by leveraging investments, avoiding duplication of effort, and achieving greater economies of scale that allow them to build their networks at a much lower cost.

Regional advisory boards and planning commissions are one way states have enabled the local public safety entities to take part in planning and participating in state and regional systems. In other areas, states have established local user forums to ensure that the local users have a voice in the development of the new systems.

States and regions are successfully implementing shared, interoperable wireless systems.

Statewide and regional systems are being developed in many areas of the country. The development of these systems takes time, dedication, and a commitment to sharing resources. During the symposium, speakers from Hawaii and Colorado provided updates on developments involving their states.

Hawaii. In Hawaii, state and federal agencies have come together to develop a microwave backbone that allows communications connectivity between the islands. The system, known as the Rainbow Communications System, was established more than 20 years ago as the result of the need of several federal agencies to expand their communications systems in Hawaii. At the same time, Hawaii was seeking to upgrade its communications system. The Rainbow System is not a statewide, interoperable communications system, but a sharing of communications by state and federal agencies. Each agency came to the table with different resources. The federal agencies brought financial support and spectrum availability, while the state entities managed the land or facilities where the communications sites were needed. The Rainbow System is governed by the Rainbow Executive Council, which is led by United States Customs and composed of representatives from each of the six partner agencies. Each group owns a part of the system, which ensures active and ongoing partnership and allows other agencies to use their resources.

Colorado. Colorado is developing a cooperative communications network. From the beginning, Colorado obtained the buy-in from local agencies by allowing them be involved in helping create the plan for the system. The success of the system is attributed to the states willing to give up control and work with local agencies. To date, the state system has 10 sites

with shared infrastructure. These sites are operated and owned by different counties within the state.

2.3 Local Interoperability Updates and Future Plans

In general, local agencies have developed ways to make interoperability work. But increasingly, local agencies are looking to partner and develop shared systems. The purpose of this topic was to give attendees a sense of ongoing local activities in the St. Louis region and national activities affecting the local public safety community. Three key themes emerged in this topic area. These themes were evident in the updates regarding successful wireless data and spectrum coordination efforts. These themes are described in detail below.

Public safety agencies have found workarounds to achieve interoperability during major events in the St. Louis region.

The papal visit to St. Louis raised the issue of the lack of interoperability in the region. The large number of additional personnel (from other local municipalities, the Missouri State Highway Patrol, and federal agencies such as the United States Secret Service, the Central Intelligence Agency [CIA], and FEMA that came to support the event all required interoperability with local officials in the city and county of St. Louis. During the event, most of these public safety agencies did not have radio systems that could interoperate.

Planning, cooperation, and coordination of resources and manpower became the solution to securing the safety of the Pope and that of the large numbers of people attending the event. Partnerships were developed with all local and federal agencies involved, and a multi-agency command center was established. Public safety agencies used commercial services during the papal visit. One personal communications services (PCS) company loaned equipment and allowed public safety priority access to services during the visit. A separate, temporary communications network was established for this event, which also helped provide interoperability.

Several interesting systems development efforts are taking shape in the St. Louis region.

A number of wireless systems development efforts are ongoing in the St. Louis area. These activities are beginning to address many of the region's interoperability challenges. Some of these include wireless data activities in the adjoining state of Illinois and new actions in the St. Louis area public safety community. These activities are described below:

IWIN. Illinois is currently rolling out a statewide wireless information network that is based on Cellular Digital Packet Data (CDPD), which is a standard-based, data-only, secure network. The system is known as the Illinois Wireless Information Network (IWIN). The project has involved more than six vendors and will be completed in four phases, with full statewide coverage expected by the end of the year. Two major issues in implementing this system have included installation and funding. Installation difficulties arose in installing new communications equipment installed into different sized vehicles. In addition, public safety

officers and their equipment had to be removed from active service during installation. Approval for funding from the state required two years. The initial procurement of $15 million was necessary to front money to have the cellular companies upgrade their cell sites to handle data. Installing the proper hardware in the vehicles costs approximately $10,000. Local agencies are encouraged to join the network for a one-time activation fee of $1,000 per car, in addition to installation and integration costs.

St. Louis Planning Effort. Public safety entities in the St. Louis area are beginning to plan for a new communications system. St. Louis County is proposing to build an 800-megahertz (MHz) system that will allow police and fire agencies to work jointly on a shared system. The supporters of the project are actively working to obtain local community support and to get financing by issuing bonds. They are also actively working to get support of the local community. A commission has been formed to include the entire community in the planning and creation of the system so that interests of all parties will be taken into account and that no one agency will be in charge.

Rules are being developed for the new public safety spectrum in the 700 MHz band.

In 1997, the Federal Communications Commission (FCC) allocated 24 MHz of spectrum to the public safety community, of which 2.6 MHz was set aside for interoperability. In its First Report and Order in WT Docket 96-86, the FCC established the Public Safety National Coordination Committee (NCC) to oversee planning for the interoperability spectrum in the newly allocated 700 MHz band. The FCC understands the importance of coordination in this band and hopes the NCC will support interoperability standards and planning without repeating work that has already been done to address the issue of interoperability. In addition, the FCC would like the NCC to build on the PSWN Program's groundwork in this area. The NCC has been working on these issues for more than a year and a representative provided an update during the symposium.

The committee has multiple active subcommittees. These subcommittees include the technical, interoperability, and implementation subcommittees. Much of the NCC's work that was described at the symposium came from the technical subcommittee. One of this subcommittee's more recent concerns has been protecting the guard bands for the interoperability spectrum from unwanted interference. The subcommittee is also working to develop a channel plan for spectrum and looking at receiver standards.

The committee has also recommended the formation of SIECs to administer the spectrum in each state. The PSWN Program has offered to provide administrative support and seed money to help establish the SIECs at the state level.

Additionally, panelists stressed the importance of user involvement in the NCC. Users can become involved in the NCC deliberations in various of ways. Even if they cannot attend the meetings they are encouraged to participate by writing letters or developing ex parte filings. In addition, users could simply subscribe to the NCC list serve to keep abreast of ongoing activities. More information can be found on the NCC's Web site at http://www.fcc.gov/wtb/publicsafety /ncc.html.

2.4 Federal Initiative Updates

Federal agencies have been charged by Congress to consolidate communications systems, limit spending, and create interoperable solutions with other federal agencies. Where appropriate, federal agencies are looking to partner and share resources with state and local public safety agencies.

The main purpose of this topic area was to discuss certain large-scale federal system developments and federal initiatives related to wireless data and security. Three key themes emerged in this topic area. These themes are described in detail below.

Federal agencies are developing and upgrading wireless systems in various areas of the country.

DOJ and Treasury are currently involved in implementing nationwide networks of wireless communications systems. DOJ is implementing significant changes in its communications systems. It has established a Wireless Management Office (WMO) to centralize oversight, management, and procurement of a common Justice Wireless Network (JWN). The WMO is working to consolidate a number of disparate systems, augment its network with commercial services, consolidate equipment procurements, and improve interoperability within the department and with outside agencies. DOJ is implementing pilot projects in San Diego, California; Seattle, Washington; Salt Lake City, Utah; Los Angeles, California; and South Florida. The projects consolidate DOJ components onto single systems and demonstrate improvements in interoperability.

The JWN is being built on an aggressive schedule, moving from the west coast to the east coast. The WMO has divided the country into four zones (western, central, east, and northeast). The WMO has begun planning and implementation in zones 1 and 2 (western and central). These zones were selected to take advantage of existing resources and narrowband assets, to support communications for the 2002 Olympics, and to support operations along the Southwest Border. JWN is scheduled for completion during 2004.

Treasury is also planning to implement a nationwide wireless system to support all of its components on a shared infrastructure. Treasury is planning to implement a TIA/EIA-102 (Project 25) compliant narrowband radio system known as the Integrated Treasury Network (ITN). It has established the Treasury Wireless Program Office (TWPO) to manage the development of ITN. The TWPO is also responsible for the design and implementation of ITN and is working to develop partnerships to use non-Treasury-owned systems, both state and federal.

The TWPO is testing its approach in Salt Lake City, Utah, for the 2002 Winter Olympics. The TWPO is implementing narrowband, encrypted, digital, trunked equipment and testing approaches that could serve as the basis for the ITN. This pilot system will support resident and

temporary personnel, support resident law enforcement activities, and be able to interoperate with other local, state, and federal entities, including JWN.

Treasury is continuing to examine several issues that will add more value to the ITN proposition. For example, TWPO is examining a detailed transition plan from legacy systems to the ITN. TWPO is also looking into centralized management and operations and detailed capacity planning for conventional versus trunking determinations.

In both of these efforts, federal agencies are seeking to partner with state and local agencies. It is evident from both the JWN and ITN pilot projects that the Federal Government is already partnering with state and local governments in areas where missions dictate. The Federal Government also plans to partner in jurisdictions where they have overlapping system requirements with state and local agencies. These partnerships are effective because of the economies of scale of large, shared system projects.

The Federal Government is investigating interoperability using wireless data.

The Federal Government is testing wireless data applications for the public safety community through the National Crime Information Center (NCIC). The NCIC was created by the FBI in 1967 to help criminal justice agencies improve their operations by providing a nationwide information system to support investigations. The system is currently undergoing a major upgrade known as NCIC 2000. The success of NCIC and its increased usage, coupled with technological advances such as mobile data terminals, laptops, and increased capabilities of local, state, and other federal systems, led to the NCIC 2000 initiative. During the St. Louis Symposium, representatives of the NCIC's Wireless Applications Test Program briefed attendees on the current status of activities within their program.

NCIC 2000 will provide many features in addition to its current complement of features. These enhanced features include fingerprint images, enhanced name searches, probation and parole lists, on-line manuals, improved data quality, information linking, mugshots, other images (e.g., vehicles, boats, or vehicle and boat parts), convicted sex offender lists, access to SENTRY (an index of individuals incarcerated in the federal prison system), delayed inquiry, and an on-line ad-hoc inquiry. NCIC 2000 went on line in July 1999 and transmitted its first mug shot over CDPD on August 18, 1999.

The PSWN Program will be working in conjunction with the NCIC 2000 program to evaluate the feasibility of integrating NCIC 2000 into various mobile data communications systems. This wireless applications test program will assess the reliability and ease of use of the NCIC 2000 hardware and software in different wireless environments. The wireless applications test program will also assist in developing guidelines regarding interface to various wireless communications and increase liaison between local, state, and federal criminal justice agencies regarding mobile data communications. To date, the test program involves 19 vendors, 5 public safety agencies, and 4 different infrastructures (e.g., CDPD, private voice/data system). The wireless applications test program's next steps include testing these technologies in an operational environment. Several local, county, state, and federal agencies have expressed interest in participating in the field tests.

The PSWN Program is examining key policy issues related to interoperability.

The Federal Government, through the PSWN Program, has identified five key issue areas related interoperability—coordination and partnerships, funding, spectrum, standards and technology, and security. The program has performed a variety of studies and analysis related to these issue areas. At the symposium, the program presented an overview of systems security and the program highlighted how developing system security guidelines and policies for wireless radio systems are often overlooked. The program also encouraged the audience to recognize security needs as a critical part of their thinking as they develop and upgrade systems.

The PSWN Program has developed a number of short-term solutions to communications security. They are—

- Agencies must raise awareness of systems security threats.
- Agencies can take steps to ensure the security of information transmitted on their radio systems.
- Agencies can take steps to protect the integrity of data in their computer systems.
- Agencies can take steps to ensure their systems are available during disasters or unplanned outages.

The PSWN Program has also developed several tools to help agencies in their security planning. These tools include—

- The Digital Land Mobile Radio System Security Guidelines Recommendations, which offers a set of security guidelines specifically designed for digital LMR systems
- The Land Mobile Radio System Recommended Security Policy which is designed to help agencies developing their own system security policy
- The Land Mobile Radio System Security Planning Template, which is designed to be used as a model that can be tailored to any public safety wireless system.

2.5 Coordination, Partnerships, and Funding

Coordination, partnerships, and funding are among the most common problems inhibiting wireless communications interoperability. The main purpose of this topic was to highlight challenges associated with these issues and present best practices and recommendations for a better approach to these problems. Multiple panels discussed these issues during this portion of the symposium. Five key themes emerged in this topic area. These themes were evident in the

panel discussions that considered the importance of coordination, partnerships, and funding. These themes are described in detail below.

Politics and financial issues are key obstacles to solving interoperability.

Several panelists made the point that partnerships are often a bigger, more problematic issue than technology when trying to solve interoperability problems. Getting partners on board is a long slow process, and if not successful, can hold up the development of shared systems. Speakers from Missouri and Montana highlighted these obstacles during the symposium.

Missouri has faced a number of issues in trying to develop partnerships for a statewide system. The state highway patrol is on a very high frequency (VHF) low band, and began looking at a new system on its own. However, other state groups, such as the National Guard and State Emergency Management Agency (SEMA) were also interested in joining a statewide system. The three agencies decided to look into a joint system together, as a cost saving measure. Consideration was also given to partnering with the Federal Government, but there were concerns regarding a high demand for frequency. The following difficulties have surfaced and have slowed the planning process for a statewide system in Missouri:

- Performing centralized planning at the state level
- Including local entities on the system
- Including all agencies within the state, not just public safety agencies
- Creating interoperability between the two largest systems in the state—St. Louis, which has a Motorola System and Kansas City, which has a new ComNet-Ericsson system.

Montana has experienced political and funding difficulties when trying to implement a statewide system. A statewide trunked, VHF system was under consideration a few of years ago, but political considerations blocked the system when it became apparent the state legislature was not interested in a new public safety wireless system. The state has begun to address political leaders' concerns by trying to address systems issues one at a time. For instance, they have started looking at systems coverage overlap and shared facilities and systems.

Successful coordination requires bringing together all key players.

Several areas of the country have developed successful partnerships, which have in turn lead to successful systems development. In all of these areas, the common denominator was having all of the parties within the region working in coordination with one another to develop the system.

In Montana, for instance, the state has worked with the PSWN Program to bring key players together to develop a shared tower site. The challenge became to share a site and a tower and to keep interference at a minimum. Coordinating all of the key players was critical to the

success of the project. A unique working group was developed for this task. A major lesson learned was that everyone should be involved in the process from the beginning.

Another example of a successful partnership is in the Washington, DC, metropolitan area and involves the Council of Governments (COG), which comprises officials from the District of Columbia and 12 counties adjoining Washington, DC. As a result of interoperability shortcomings during a major airliner incident, six of the 12 jurisdictions now use an 800-MHz trunked system and each system can communicate with systems of the other 5 jurisdictions. Six other jurisdictions are planning or constructing new systems, all of which are using the same vendor. This cooperative action has enabled rapid acceptance of a common radio system and increased interoperability in the region. It has also allowed for large purchasing contracts enabling COG member agencies to purchase the same equipment at reduced rates.

Getting champions at executive levels of government is critical for large systems developments.

It is important to gain political and executive backing at all levels of government to support the planning and development of new wireless communications systems. Political champions can give a project credibility, ensure funding for the project's survival, and argue for the project against opposition.

In Wisconsin, for instance, the project leaders of statewide systems tried to involve politicians at all levels of state and local government. Project leaders tried to establish an executive oversight committee to resolve disagreements between agency heads and program managers. Wisconsin also found that the relationship between budget people and the agency heads was vital in promoting the plan.

The panelist from Colorado related the importance of persuading champions and using them to raise the priority of funding the systems within their level of government. In 1997, a state senator was willing to sponsor legislation to support funding for a statewide system. Support was garnered from the top down–essentially from the governor and the legislature. Opposition groups emerged at the county and municipal levels because they had not been informed of the plan. This opposition was one of the major reasons for the lack of success at this attempt to establish a statewide system.

A number of issues should be considered when having the local agencies participate in a regional or statewide network.

Some states have managed to integrate the local public safety community into a statewide system by taking a low-key approach, allowing the local agencies to decide to join the system on their own. This made the local agencies a part of the decision-making process of the system. Cooperation was found to be the key to making these systems work.

In the case of Mesa and Phoenix, Arizona, the following issues were found to be important to a cooperative regional network. The participants agreed to—

- Manage the system and to meet regularly
- Plan and negotiate future system additions together
- Make interoperability and roaming mandatory across the network
- Allow users to be added with approval from Phoenix or Mesa authorities.

Innovative funding methods to finance wireless communications systems are available.

During the symposium, it was noted that $18 billion, possibly much more, would be needed to replace our Nation's public safety wireless infrastructure. Obtaining the large amounts of funding needed to plan, build, and maintain a public safety communications system may be one of the greatest challenges of public safety agencies. Agencies do not typically consider life-cycle cost issues when planning a system and therefore find unexpected costs arise during the system's life. Some agencies have discovered innovative ways of funding their systems. During the symposium, several different funding sources (or potential funding sources) were presented. These sources are described below.

One method of gaining funding was to build and leverage strong support from state legislatures through the passage of enabling legislation and the establishment of sustainable sources of funding (e.g., radio communications trust funds). The Colorado legislature created a public safety communications trust fund to fund its system. The sum of $50 million was placed in the fund as capital money out of the state's budget which could grow and earn interest. The interest on this money could also be used to buy equipment.

Grants are another way that states can fund interoperability systems. One such grant is administered by NTIA to set up demonstration projects by county and local governments. In addition, NTIA provides matching funds for states to help them maintain their systems. This funding source also helps to raise the level of awareness at the state and local levels that the Federal Government is interested in advancing technology in the public safety sector.

Another funding source is the Interagency Working Group on Funding (IWGF). The IWGF is a federal grant program set up by the Attorney General to establish funding for planning, demonstration, and technical assistance for statewide public safety communications systems. An important point about this grant is that it is to be used for statewide interoperability systems, not just radio equipment. The IWGF has been included in the President's budget for fiscal year 2001. The PSWN Program is to play a significant role in the rollout and implementation of the grant program, for example, through joint administration of technical assistance (with the National Institute of Justice and NTIA) and joint administration of demonstration projects (with NTIA).

Funding is sometimes made available by innovative means and sometimes it is available as a matter of timing. The 800-MHz system in use by the prison system in California came about at a time when the state was upgrading the prison system in the 1980s and was able to incorporate a new communications system. Illinois located funds in the form of inmate commission funds and were able to use those funds for the statewide data system.

2.6 Vendor Panel Discussion

The vendor panel addressed the future of LMR from the equipment manufacturer perspective. The equipment manufacturers are key players in improving interoperability. They can affect standards development, ensure competitive prices, and add features that improve the delivery of public safety services. The St. Louis PSWN Program Symposium was the first in which vendors were invited to join a panel where they faced questions directly from the users and were asked to comment on future plans for their products. The vendors attending the panel discussion were Motorola, Nextel Communications, EF Johnson, ComNet-Ericsson, Nokia Americas, Racal Communications, JPS Communications, and V-One. Three key themes emerged in this topic area. These themes were evident regarding the discussion of standards and new technologies in public safety wireless radio equipment. These themes are discussed in detail below.

Standards are necessary for public safety wireless communications equipment.

Standards are essential to the development of future radio systems if interoperability is to be achieved. Currently, there are standards for most, if not all, major electrical components (e.g., VCRs and computers), but there are only a handful of standards for LMR systems. Although certain standards have been generally accepted, none have been widely adopted and this limits competition and the development of new features for users.

The most widely accepted standard in the United States is Project 25. It is being developed in two phases. Phase I focuses on developing standards for Frequency Division Multiple Access (FDMA) technologies only. Phase II focuses on developing standards for both FDMA and two- and four-slot Time Division Multiple Access (TDMA). Phase II has three solutions: an FDMA solution, similar to Phase I, with compression to 6.25 kilohertz (kHz); a 4-slot TDMA solution that uses a 25 kHz channel; and a 2-slot TDMA solution that uses 12.5 kHz channel and supports 36 kilobits (kb) of data throughput.

The vendors discussed their approaches regarding developing Project 25 based equipment. ComNet-Ericsson is developing Phase II compatible radios that use a 2-slot, 12.5 kHz TDMA solution. The Motorola representative stated that Motorola is continuing to develop FDMA solutions, but stated that it was looking at the evolution of Project 25. The EF Johnson representative stated that they are currently building Project 25 compliant systems and had information forthcoming about additional products. Nokia's representative said Nokia was exploring the possibilities and needed to look into the issue more before making a business decision.

New technologies are under development for wireless radio communications.

A portion of the vendor discussion was spent on new and future technologies that may change the way public safety wireless networks are developed. These technologies included voice-over-IP, software defined radios, and multiband radios.

Voice-Over-IP. Voice-over-IP brings an interesting opportunity to public safety. The technology would allow radios to use the Internet as the primary backbone and bring all of the associated benefits to public safety. Several vendors suggested that they would have voice-over-IP products very soon. The EF Johnson representative stated that voice-over-IP was a viable solution for public safety communications and anticipated an announcement regarding its developments within the next year. The JPS Communications representative indicated that their product would also incorporate voice-over-IP within the next year. Motorola and ComNet-Ericsson were also researching voice-over-IP products.

Voice-over-IP, however, has a significant number of challenges, specifically as it relates to the public safety environment. Most of the concerns reflect the potential problems with public safety's mission critical environment. Some vendors warned of a reduced quality of service for voice-over-IP products. They also warned that public safety systems must be secure, and that the time it takes to process encryption with voice-over-IP may be too long for public safety.

Software-Defined Radios. Software-defined radios are just being accepted as a viable option for public safety communicators. These products are still very complex and expensive to develop. Most vendors believe that it will be some time before the software-defined radio market truly opens to a more mass market. Most vendors also believe that software-defined radios depend on the development of standards.

Multiband Radios. Another future technology could be the use of multiband radios. It was the general view of equipment manufacturers that although these radios had a large potential value, many issues must be resolved before it becomes a viable option for public safety. Most vendors believed that these radios were expensive and larger than traditional public safety radios. In spite of the current limitations, certain vendors believed multiband radios could be a reality, especially in regard to the new 700 MHz band. Motorola had been looking at the new 700 MHz band and at ways to enable radios to work in both the 700-MHz and 800-MHz bands. Several of the vendors responded that they were looking into the issue but would move forward only if they felt it was viable from a business standpoint.

Vendors see many challenges facing public safety communications.

The equipment manufacturers are optimistic about the future but still see many challenges that must be addressed in the wireless public safety communications environment. First, the vendors recognize that the public safety community does not have funding for migrating to new systems. Secondly, vendors believe that the fragmentation of frequency bands is a major challenge because, although there are similarities in the radios, there are significant development requirements for radios in each band. These differences affect the costs for radios in all bands. Finally, vendors also indicated that coverage is a major concern for public safety agencies.